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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/902,170	07/11/2001	Masahiko Ando	H6810.0011/P011	8805
24998	7590	06/22/2004	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			NGUYEN, KHIEM D	
2101 L STREET NW			ART UNIT	
WASHINGTON, DC 20037-1526			PAPER NUMBER	
			2823	

DATE MAILED: 06/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/902,170	Applicant(s) ANDO ET AL.	
	Examiner Khiem D Nguyen	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04/16/04.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-21, 23-32, 34-58, 60-70, 72-81 and 83-98 is/are pending in the application.
- 4a) Of the above claim(s) 35-49 and 84-98 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-21, 23-32, 34, 50-58, 60-70, 72-81 and 83 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 16th, 2004 has been entered. A new rejection is made as set forth in this Office Action. Claims (1-9, 11-21, 23-32, 34-58, 60-70, 72-81, and 83-98) are pending in the application. Claims 10, 22, 33, 59, 71, and 82 were canceled and claims 35-49 and 84-98 are withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-8, 13-20, 24-31, 50-57, 62-69, and 74-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art of this application (AAPA) in view of Tsujimura et al. (U.S. Patent 6,391,691).

In re claims 1, 3, 5, 13, 24, and 50, AAPA discloses a method of fabricating a thin film transistor comprising the steps of (See Discussion of the Related Art on page 1-2 of this application and **FIGS. 6(a)-(d)**): providing a gate (**FIG. 6(d): 62**) over a substrate

(FIG. 6(d): 61); providing a gate insulating layer (FIG. 6(d): 63) over the gate and substrate; providing an amorphous silicon layer (FIG. 6(d): 64) having a first resistance over the gate insulating layer; providing an impurity on the surface of the amorphous silicon layer (FIGS. 6(a)-(b)); forming a drain electrode (FIG. 6(d): 66) and source electrode (FIG. 6(d): 67) separated by a channel region over a contact portion with the amorphous silicon layer; and removing the impurity from the channel region (FIG. 6 (c)) to form a contact layer (FIG. 6(d): 65) within the amorphous silicon layer wherein the contact layer has a second resistance lower than the first resistance (page 2, lines 3-10).

AAPA does not explicitly disclose diffusing the impurity into the contact portion to form the contact layer within the amorphous silicon layer.

Tsujimura discloses a method of fabricating a thin film transistor comprising the steps (col. 3, line 46 to col. 4, line 19 and FIGS. 1-2): providing a gate (FIG. 1(f): 12) over a substrate (FIGS. 1(a-f): 1); providing a gate insulating layer (FIG. 1(e): 10) over the gate and substrate; providing an amorphous silicon layer (FIG. 1(e): 9) having a high resistance over the gate insulating layer; providing an impurity (FIG. 1(c): 7 and 8) on the surface of the amorphous silicon layer; forming a drain electrode (FIG. 1(b): 5) and source electrode (FIG. 1(b): 4) separated by a channel region over a contact portion with the amorphous silicon layer; and removing the impurity (FIG. 1(c): 8) from the channel region (col. 3, line 62 to col. 4, line 4 and FIG. 1(c)) and diffusing the impurity into the contact portion (col. 4, lines 6-19) to form a contact layer (FIG. 1(e): 11) within the amorphous silicon layer. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of AAPA and Tsujimura to

enable the process of diffusing the impurity into the contact portion to form a contact layer within the amorphous silicon layer of AAPA to be performed and furthermore to achieve a good ohmic contact between source and drain electrodes and a semiconductor layer made of, for example, amorphous silicon in fabricating a thin film transistor (col. 1, lines 14-17).

In re claims 2, 14, 25, 51, 63, and 74, Tsujimura discloses wherein the contact layer contains a concentration of the impurity of at least 0.1% (col.4, lines 6-19).

In re claims 3, 15, 26, 52, 64, and 75, Tsujimura discloses wherein removing of impurity from the channel region is performed by exposure to hydrogen plasma (col. 3, line 58 to col. 4, line 4).

In re claims 4, 6, 8, 16, 18, 20, 27, 29, 31, 53, 55, 57, 65, 67, 69, 76, 78, and 80, Tsujimura discloses wherein the exposure is conducted for a time duration using a plasma chemical vapor deposition apparatus. There is no evidence indicating the hydrogen plasma exposure time duration, the heat annealing temperature and time duration, and the thickness of the amorphous silicon layer is critical and it has been held that it is not inventive to discover the optimum or workable temperature, time duration, and thickness of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the

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chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claims 5, 17, 28, 54, 66, and 77, Tsujimura discloses wherein the diffusion of the impurity into the contact portion is performing by heat annealing (col. 4, lines 4-19).

In re claims 7, 19, 30, 56, 68, and 79, Tsujimura discloses wherein the impurity is phosphorus (col. 3, line 58 to col. 4, line 4).

In re claim 13, Tsujimura discloses wherein the amorphous silicon layer (**FIG. 1(e): 9**) does not contain the impurity (col. 4, lines 6-19).

In re claims 24, 62, and 73, Tsujimura discloses wherein essentially none of the impurity is diffused into the contact portion prior to removing step (col. 3, line 46 to col. 4, line 19).

In re claims 50, 62, and 73, Tsujimura discloses a method of fabricating a liquid crystal display (LCD) comprising the steps of providing a plurality of thin film transistors arranged on a LCD substrate in a matrix form (col. 4, lines 6-57).

2. Claims 9, 11-13, 21, 23, 24, 32, 34, 58, 60-62, 70, 72, 73, 81, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art of this application (AAPA) in view of Tsujimura et al. (U.S. Patent 6,391,691) as applied to claims 1-8, 13-20, 24-31, 50-57, 62-69, and 74-80 above, and further in view of Washizuka et al. (IDW 1997 pp. 207-210).

In re claims 9, 11, 21, 32, 58, 62, 70, 73, and 81, **Washizuka** discloses wherein the diffusing step is performed simultaneously with an annealing step for a capping layer

provided over the electrode and the channel region and wherein etching the amorphous silicon layer utilizing a common photoresist to form the electrodes (page 208 and FIGS. 2-3). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of AAPA, Tsujimura, and Washizuka to achieve high image quality of TFT-LCDs (page 207).

In re claims 12, 23, 34, 61, 72, and 83, Washizuka discloses wherein the steps are entirely conducted by using an etching apparatus and a protection film forming apparatus while connected in a vacuum state (page 208 and FIGS. 2-3).

In re claims 13, 24, and 60, Washizuka discloses wherein etching the silicon layer utilizing a common photoresist to form a drain electrode and a source electrode separated by a channel region over a contact portion with amorphous silicon layer (page 208 and FIGS. 2-3).

Response to Amendment

Response to Arguments

Applicants contend that the cited prior art, even in combination, does not teach or suggest all of the limitations found in independent claims 1, 13, and 24. In particular, the art does not teach or suggest, “providing an impurity on the surface of the amorphous silicon layer,” as recited in claim 1; “providing an impurity over the amorphous silicon layer, wherein the amorphous silicon layer does not contain the impurity,” as recited in claim 13; or “providing an impurity on the surface of the amorphous silicon layer... wherein essentially none of the impurity is diffused into the contact portion prior to the removing step,” as recited in claim 24.

In response to Applicants contention that the cited prior art in combination does not teach or suggest providing an impurity on the surface of the amorphous silicon layer wherein the amorphous silicon layer does not contain the impurity such that essentially none of the impurity is diffused into the contact portion prior to the removing step as recited in the independent claims, examiner respectfully disagree. Applicants are directed to pages 3 and 4 in the present Office Action where the newly discovered reference Tsujimura (U.S. Patent 6,391,691) in combination with the applicant's admitted prior art of this application (AAPA) discloses providing an impurity (FIG. 1(c): 7 and 8) on the surface of the amorphous silicon layer (FIG. 1(e): 9); removing the impurity (FIG. 1(c): 8) from the channel region (col. 3, line 62 to col. 4, line 4 and FIG. 1(c)) and diffusing the impurity into the contact portion (col. 4, lines 6-19) to form a contact layer (FIG. 1(e): 11) within the amorphous silicon layer wherein essentially none of the impurity is diffused into the contact portion prior to removing step (col. 3, line 46 to col. 4, line 19). For there reasons, examiner holds the rejection proper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.

June 18, 2004

A handwritten signature in black ink, appearing to read 'W. David Coleman', written over a horizontal line.

**W. DAVID COLEMAN
PRIMARY EXAMINER**